

BETTER SITE DESIGN

AN INFORMATIONAL BROCHURE FOR VIRGINIA COMMUNITIES IMPLEMENTING THE CHESAPEAKE BAY PRESERVATION ACT













The Impacts of Urbanization

Development patterns in most Virginia communities are the result of numerous individual site planning decisions made over long periods of time. The cumulative effects of these decisions have dramatically transformed the landscape. Development alters the surface of the land by replacing natural cover and native vegetation with rooftops, roads, parking lots, driveways, and sidewalks. These hard surfaces are impermeable to rainfall and are collectively known as impervious cover.

Urbanization can have a negative impact on the quality of our waters and aquatic resources. For instance, the increased impervious cover in a watershed, in conjunction with the loss of natural cover, alters hydrology by preventing the infiltration of water into the soil and increasing the frequency and volume of stormwater runoff that flows to a watercourse. The land disturbance that occurs during the development process also adds excess sediments that can choke streams and cloud tidal waters. In turn, these fundamental changes impact both the water quality and habitat of receiving waters. A summary of the cumulative impacts of urbanization on water resources is presented in the box on page 2.

More and more communities are struggling to achieve the goal of economic growth that also protects the local environment. Unfortunately, many communities have found that their own development codes and standards can actually work against this goal. For example, local codes and standards often create needless impervious cover in the form of wide streets, expansive

Cumulative Impacts of Land Development on Aquatic Resources A Summary of Research

 Higher peak discharge rates and greater flooding	 Increased nutrient loadings that cause algal blooms and areas of inadequate oxygen supply
 Reduced groundwater recharge and lower stream flow during dry weather	 Increased sediment loadings that cloud tidal waters and prevent submerged aquatic vegetation (SAV) from growing and choke benthic organisms such as oysters
 Greater streambank erosion and enlargement of the stream channel	 Increased bacteria loadings may result in levels that exceed recreational contact standards
 Decline in stream bed quality due to embedding, sediment deposition, and turnover, resulting in degradation of stream habitat structures and loss of pool and riffle structure	 Lower diversity of plant, aquatic insects and native fish species, loss of sensitive fish species, and lower spawning success of anadromous fish
 Fragmentation of the riparian forest cover	 Warmer stream temperatures

parking lots, and large lot subdivisions. At the same time, local codes often give developers little or no incentive to conserve natural areas that are important for watershed protection.

Reducing the Impacts of Urbanization Through Virginia's Chesapeake Bay Preservation Act

Land can be used and developed in ways that minimize impacts to water quality. The first sentence of the Chesapeake Bay Preservation Act, enacted in 1988, states that "Healthy state and local economies and a healthy Chesapeake Bay are integrally related; balanced economic development and water quality protection are not mutually exclusive." The Chesapeake Bay Preservation Act was designed to enhance and protect water quality while still allowing reasonable development to continue.

The *Chesapeake Bay Preservation Area Designation and Management Regulations*, adopted by the Chesapeake Bay Local Assistance Board, address nonpoint source pollution by identifying and managing certain lands called Chesapeake Bay Preservation Areas (CBPAs) – lands where development has the potential to impact water quality most directly. Land in a CBPA is categorized as either a Resource Protection Area (RPA) or a Resource Management Area (RMA). RPAs are sensitive lands at or near the shoreline or along the banks of perennial streams that have an intrinsic water quality value due to the ecological and biological processes they perform. RMAs are lands that without proper management, have the potential to significantly degrade water quality or

to damage the protective features of the RPA. Development within RPAs is restricted to water dependent uses or redevelopment.

Land use within RMAs, on the other hand, is not limited by the Chesapeake Bay Preservation Act. Any development permitted by local zoning is allowed to occur within an RMA, but it must be accomplished using the 11 performance criteria from the *Chesapeake Bay Preservation Area Designation and Management Regulations*, which work to reduce nonpoint pollution at its source. The following three general performance criteria are perhaps more subjective than the others, but equally important for protecting water quality. The three general performance criteria provide the broad objectives to be met through better site design and are the focus of the Model Development Principles described in this publication.

No more land shall be disturbed than is necessary to provide for the desired use or development. (9VAC 10-20-120.1)

Indigenous vegetation shall be preserved to the maximum extent possible consistent with the use and development allowed. (9VAC 10-20-120.2)

Land development shall minimize impervious cover consistent with the use or development allowed. (9VAC 10-20-120.5)

The Site Design Process

All too often, the application of the three general performance criteria has focused only on the nutrient control aspects and has been relegated to a technical exercise of engineering a site for stormwater control. The use of Best Management Practices (BMPs) to mitigate the increased runoff and to treat the pollutants it contains is typically the result. Good site design provides a more appropriate, and cost effective, approach to meeting the performance criteria. The key to successfully incorporating these criteria into development plans is simply to use them at the beginning of the site design process, rather than at the end. The same three questions should be asked when considering each element of a design: Does this minimize land disturbance? Does this preserve vegetation? Does this minimize impervious cover?

As a first step, sensitive features should be evaluated and preserved to the greatest extent possible. This may be accomplished by concentrating development in the most suitable portions of a site. At a minimum, steep slopes, non-RPA wetlands, intermittent streams, and stands of mature forests should be considered as features worthy of preservation. Once the most suitable areas of a site have been determined, the design process should focus on how to meet the needs of the proposed development within these areas. This phase includes such design work as laying out lots and locating structures, roads, driveways, and parking areas. Included in this phase is consideration of specific issues related to impervious cover such as necessary road widths. When this process is followed, and the techniques described below are used, the result should be less need for stormwater management in the form of expensive BMPs because less stormwater runoff is generated, and more filters into the ground. In addition to the cost savings derived from fewer structural BMPs (and their on-going maintenance headaches), development costs are minimized because better designs require less clearing, grading, and pavement.

The Model Development Principles

The Model Development Principles outline 16 areas for consideration by local planners, developers, citizen groups, design professionals, and policy makers to change the standard approach to site design. The results can be more environmentally sensitive, economically viable, and locally appropriate development.

In many ways, our communities are a mix of three habitats. The first habitat includes the open spaces and natural areas that are relatively undeveloped. The second is the habitat where we live and work, including our yards and homes. The third habitat is devoted to the automobile, and includes roads, driveways, and parking lots. The size, appearance, location, and design of all three areas are determined in large part by local subdivision, zoning, clearing and

grading, and landscaping ordinances and state road and utility standards.

Each of the Model Development Principles falls into one of the following three areas:

- *Conservation of Natural Areas.* Principles 1 and 2 address codes and ordinances that promote (or impede) protection of existing natural areas and incorporation of open spaces into new development.
- *Lot Development.* Principles 3 through 6 focus on the regulations which determine lot size, lot shape, housing density, and the overall design and appearance of our neighborhoods.
- *Residential Streets and Parking Lots.* Principles 7 through 16 focus on those codes, ordinances, and standards that determine the size, shape, and construction of parking lots, roadways, and driveways in the suburban landscape.

The Model Development Principles



Conservation of Natural Areas

1. Conserve trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native plants. Wherever practical, manage community open space, street rights-of-way, parking lot islands, and other landscaped areas to promote natural vegetation.



(Photo Courtesy: Randall Arendt)

2. Clearing and grading of forests and native vegetation at a site should be limited to the minimum amount needed to build lots, allow access, and provide fire protection. A fixed portion of any community open space should be managed as protected green space in a consolidated manner.

Lot Development



(Photo Courtesy: Randall Arendt)

3. Promote open space development that incorporates smaller lot sizes to minimize total impervious area, reduce total construction costs, conserve natural areas, provide community recreational space, and promote watershed protection.



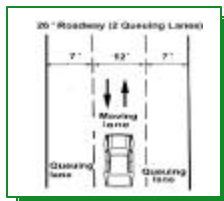
4. Relax side yard setbacks and allow narrower frontages to reduce total road length in the community and overall site imperviousness. Relax front setback requirements to minimize driveway lengths and reduce overall lot imperviousness.



5. Promote more flexible design standards for residential subdivision sidewalks. Where practical, consider locating sidewalks on only one side of the street and providing common walkways linking pedestrian areas.



6. Reduce overall lot imperviousness by promoting alternative driveway surfaces and shared driveways that connect two or more homes together.

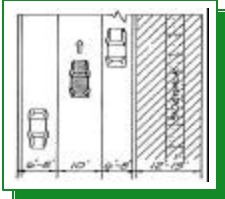


Residential Streets and Parking Lots

7. Design residential streets for the minimum required pavement width needed to support travel lanes; on-street parking; and emergency, maintenance, and service vehicle access. These widths should be based on traffic volume.



8. Reduce the total length of residential streets by examining alternative street layouts to determine the best option for increasing the number of homes per unit length.



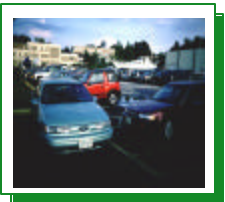
9. Residential street right-of-way widths should reflect the minimum required to accommodate the travel-way, the sidewalk, and vegetated open channels. Utilities and storm drains should be located within the pavement section of the right-of-way wherever feasible.



10. Minimize the number of residential street cul-de-sacs and incorporate landscaped areas to reduce their impervious cover. The radius of cul-de-sacs should be the minimum required to accommodate emergency and maintenance vehicles. Alternative turnarounds should be considered.



11. Where density, topography, soils, and slope permit, vegetated open channels should be used in the street right-of-way to convey and treat stormwater runoff.



12. The required parking ratio governing a particular land use or activity should be enforced as both a maximum and a minimum in order to curb excess parking space construction. Existing parking ratios should be reviewed for conformance taking into account local and national experience to determine if lower ratios are warranted and feasible.



13. Parking codes should be revised to lower parking requirements where mass transit is available or enforceable shared parking arrangements are made.



14. Reduce the overall imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in the spillover parking areas where possible.

(Source: Wells, 1995)



(Source: ULI, 1997)



15. Provide meaningful incentives to encourage structured and shared parking to make it more economically viable.

16. Provide stormwater treatment for parking lot runoff using bioretention areas, filter strips, and/or other practices that can be integrated into required landscaping areas and traffic islands.

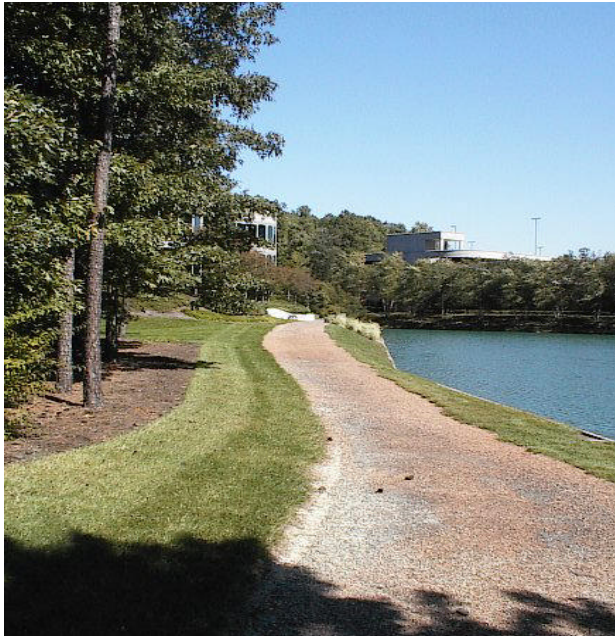
Relationship to the Chesapeake Bay Preservation Area Designation and Management Regulations Performance Criteria

The table below shows how incorporating the Model Development Principles into a site design can help address the three general performance criteria of minimizing land disturbance, preserving indigenous vegetation, and minimizing impervious surface. However, it is important to keep in mind that these principles are only a set of tools to use in the process of site design. Simply incorporating a principle from the list does not imply that the performance criteria of the *Chesapeake Bay Preservation Area Designation and Management Regulations* have been met.

Model Development Principles and the Chesapeake Bay Preservation Area Designation and Management Regulations Performance Criteria			
Model Development Principle	Minimizes Land Disturbance	Preserves Indigenous Vegetation	Minimizes Impervious Surface
1. Native Plant & Tree Conservation	✓	✓	
2. Minimized Clearing & Grading	✓	✓	
3. Open Space Design	✓	✓	
4. Shorter Setbacks & Frontages	✓	✓	✓
5. Common Walkways			✓
6. Shared Driveways			✓
7. Narrower Streets	✓	✓	✓
8. Shorter Streets			✓
9. Narrower Right-of-Way Widths	✓	✓	
10. Smaller & Landscaped Cul-de-Sacs			✓
11. Vegetated Open Channels			✓
12. Reduced Parking Ratios	✓	✓	✓
13. Mass Transit & Shared Parking			✓
14. Less Parking Lot Imperviousness	✓	✓	✓
15. Structured Parking	✓	✓	✓
16. Treated Parking Lot Runoff	✓		

A note to the development community...

Careful site design and layout are an integral part of addressing the Chesapeake Bay Preservation Act performance criteria. As such, the Model Development Principles outlined here are offered as a guide to better land development. Land planning, design, and watershed professionals involved early in the site design phase of a project can assist a developer in enhancing the integration of the “built” environment with the natural environment. However, it should be recognized that the principles are not intended to be rigid mandates, but must be adapted to reflect the unique characteristics of each community and each development. Furthermore, not all principles will apply to every development or community.



A note to local governments...

Often, a community's own development codes and standards can actually be impediments to better site design. These principles provide planners, developers, and local officials with benchmarks to investigate where current zoning, parking, street, and subdivision codes may be modified to minimize land disturbance, minimize impervious surfaces, and preserve indigenous vegetation.

The Model Development Principles should be consistent with larger community goals (both economic and environmental) that are put forth in comprehensive resource protection or watershed management plans. The principles should be implemented as part of a flexible, locally-adapted strategy for better site planning and are not intended to be a “one-size fits all” standard.

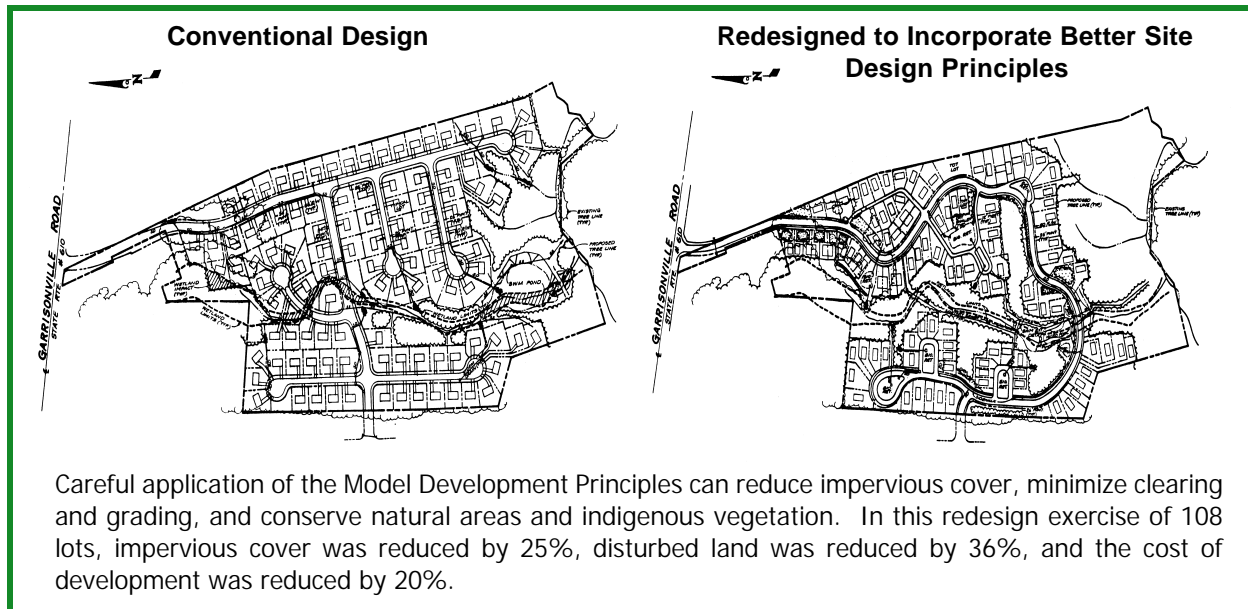
Additional Support

The Model Development Principles set forth in this document were adapted from a series of 22 nationally endorsed principles developed by the Site Planning Roundtable, a national cross-section of diverse planning, environmental, home builder, fire, safety, public works, and local government personnel.

To promote more widespread implementation of the Model Development Principles, the Center for Watershed Protection put together a comprehensive manual entitled *Better Site Design: A Handbook for Changing the Development Rules in Your Commu-*

Some Documented Benefits of Applying the Model Development Principles

- | | |
|---|--|
| <ul style="list-style-type: none"> Protection of local streams, lakes, rivers, and the Chesapeake Bay | <ul style="list-style-type: none"> Protection of sensitive forests, wetlands, and habitats |
| <ul style="list-style-type: none"> Increases in local property values and tax revenues | <ul style="list-style-type: none"> Reduction of stormwater pollutant loads |
| <ul style="list-style-type: none"> A more aesthetically pleasing, and thus more marketable, naturally attractive landscape | <ul style="list-style-type: none"> More pedestrian-friendly neighborhoods |
| <ul style="list-style-type: none"> Neighborhood designs that provide a sense of community | <ul style="list-style-type: none"> Easier compliance with wetland and other resource protection regulations |
| <ul style="list-style-type: none"> Safer residential streets | <ul style="list-style-type: none"> Reduced soil erosion during construction |
| <ul style="list-style-type: none"> Reduced development construction costs | <ul style="list-style-type: none"> More open space for recreation |
| <ul style="list-style-type: none"> More sensible locations for stormwater facilities | <ul style="list-style-type: none"> Preservation of urban wildlife habitat in natural areas |



nity. This handbook details the technical support for the 22 Model Development Principles and outlines current and recommended practices along with research data on the economic, market, legal, safety, and social benefits of better site designs. Also featured is a codes and ordinance worksheet designed to help communities target the development rules most in need of change in their localities. Finally, the handbook guides users through the process of coordinating the local site planning roundtable consensus process necessary to actually change development rules to promote better site design.

A companion document to this brochure, *Better Site Design: An Assessment of Better Site Design Principles for Communities Implementing Virginia's Chesapeake Bay Preservation Act*, examines the Model Development Principles in the context of development in Virginia communities implementing the Chesapeake Bay Preservation Act. Case studies examine actual residential and commercial developments in Virginia that incorporated site design techniques promoted by the Model Development Principles. Evaluation factors

include whether there was reduced impervious cover, limited clearing and grading, and preservation of indigenous vegetation as a result of better site design, while development cost and marketability are also taken into account. The text includes guidance for site designers and site plan reviewers, an overview of Virginia Department of Transportation requirements, and a list of better site design resources.

References

- Arendt, R. 1994. *Designing Open Space Subdivisions*. Natural Land Trust, Media, PA.
- Urban Land Institute. 1992. *Density by Design*. James W. Wetling and Lloyd W. Bookout, editors. Urban Land Institute, Washington D.C.
- Urban Land Institute. 1997. *America's Real Estate*. Urban Land Institute, Washington D.C.
- Wells, C. 1995. *Impervious Surface Reduction Study: Final Report*. City of Olympia Public Works Department. Water Resources Program. Olympia, WA.



This informational brochure was funded by a grant from the Chesapeake Bay Local Assistance Department.

This informational brochure was funded in part by the Virginia Coastal Resources Management Program at the Department of Environmental Quality through Grant #NNA770Z0204 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended.

The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its subagencies.

This brochure was written and produced by
 Center for Watershed Protection, Inc., 8391 Main Street, Ellicott City, Maryland 21043
 (410) 461-8323 (phone) www.cwp.org (website)
 (410) 461-8324 (fax) center@cwp.org (e-mail)

